

**ENERGY CONSERVATION MEASURES
IN THE DOMESTIC SECTOR**

Interim Report

**Submitted to
The Energy Management Centre**

**Tata Energy Research Institute
7, Jor Bagh, New Delhi-110 003**

July 1990

Project Team

Project co-ordinator	Dr. Bhaskar Natarajan
Full-time professionals	Ms. Abhilasha Behl
	Mr. G. Chandrasekar

Acknowledgements

We acknowledge assistance from Ms. Harmander Ahuja, Ms. Charu Mathur and Mr. Devendra Tyagi in carrying out the survey on small scale industries and in data analysis.

Contents

	Page No.
1. The Power Scenario in India	01
2. Need for the Study	05
3. Methodology	10
4. Data Analysis	
Brand Consciousness	16
Analysis of data on small scale sector	20
5. Conclusions	29
Annexures	

1. The Power Scenario in India

The convenience with which electricity can be used at the end-point, has been the major reason for the increasing share of electricity in total commercial energy consumed, over the last three decades. The share of electricity has increased from 7.65 percent in 1972/73 to 10.2 percent in 1980/81, and to 12.7 percent in 1987/88. Electricity consumption has been growing at around 10 percent compounded during the last three decades.

The Indian economy in its present phase of growth is moving in a direction that is energy intensive. The commercial energy consumption to GDP elasticity coefficient for the period 1960/61 to 1982/83, which was 1.62, has declined to 1.45 in 1986-87. Still, the Indian economy remains energy intensive particularly as compared to the developed countries where this coefficient is less than unity e.g. in France, U.S.A and U.S.S.R, its 0.76, 0.81 and 0.85 respectively [1].

The elasticity coefficient of electricity consumption to GDP during the period 1980/81 to 1988/89 has been estimated to be approximately 1.8 [1]. This figure is higher than the elasticity coefficient of energy consumption to GDP, which indicates that the relative share of electricity in total commercial energy consumption has been increasing over time.

The installed capacity in the power sector (utilities) increased from about 4653 MW in 60's to 59040 MW as at end of March 1989.

Table 1: Trends in installed capacity for 1960-61 to 1989-90 (MW)

Year	All India installed capacity
1960-61	4653
1970-71	14709
1980-81	30214
1985-86	46769
1988-89	59040
1989-90*	64823

* Expected/Projected Figure for end of seventh plan.

Source: The Economic Survey 1989-90 and The Energy Scene, Dec.'87.

As is evident from Table 1, the installed capacity has been more than doubling every ten years, since 1960-61. There are plans to add another 38000 MW in the Eighth plan. In spite of substantial additions to capacity, an estimated shortage of both demand and energy to the extent of 24.79 percent and 6.35 percent respectively, has been reported for 1989-90 [2]. The average all India power shortage as a percentage of requirement during January 1990, was 8.8 percent [3]. Indications are that these shortages are likely to continue at least for the next five years.

A notable feature of consumption of electricity across different end-use sectors is the rising share of domestic and commercial sectors, which increased from 14 percent in 1960-61 to 21 percent in 1987-88; the share of the domestic sector increased from 8.9 percent in 1960-61 to 14.7 percent in 1987-88. (For details see Table 2).

Table 2: Share of electricity consumption across end-use sectors (percentage)

Sector	1960-61*	1970-71	1980-81	1984-85	1986-87	1987-88
Agriculture	5.0	12.5	19.1	20.2	22.6	25.6
Industry	74.4	67.7	58.6	55.2	52.4	48.8
Domestic	8.9	8.8	11.3	13.6	14.2	14.7
Commercial	5.1	5.9	6.0	6.1	5.8	6.0
Others**	6.5	5.1	5.0	4.9	5.0	4.9

* Source : Central Electricity Authority (1987)

** This includes transport, public lighting and miscellaneous uses

Source: UPSEB "Statistics at a glance, 1988-89", page 91

This trend can be explained by three phenomena in the development process. First, increasing migration of population from rural to urban areas which results in rising incomes and increase in standards of living, accompanied by a shift from non-commercial to commercial energy sources. Second, large scale rural electrification programmes which were taken up in order to supply electricity to rural areas, is also a major factor. Third and finally, increasing urbanisation has led to increased demand and an escalation in the ownership and use of domestic electrical appliances.

Facilities for purchase of these appliances have definitely registered an upward trend with the introduction of hire-purchase and other consumer durable finance schemes. Technological improvements have reduced the prices of these appliances considerably and have brought them closer to the reach of the consumers and this has resulted in an increase in the stock of electrical appliances. Since no data on stock of appliances exist, an alternative is to look at the increase in production of electrical appliances (Table 3).

Table 3: Trends in the production of selected domestic appliances

Product	Unit	1975	1980	1982	1985
Refrigerator	th. nos.	108	278	350	659
Airconditioner	th. nos.	9	25	30	30
Gls. Lamps	mn. nos.	129	201	272	262
Fluorescent Tubes	mn. nos.	17	28	34	43 ⁺
Electric Fan*	mn. nos.	1.3	4.1	4.6	5.2 ⁺⁺
Television*	th. nos.	39.4	35.9	155	2480 ^{**}

Source : CIER Data Book

* CMIE, Production and capacity utilisation in 600 industries (1970-86), October 1987

** Production of large, medium and small scale units

+ Source: ELCOMA Production data

++ Data refers to financial year

2. Need For The Study

Given the present state of accelerating energy demand on one hand and lagging supply on the other, the electricity boards have resorted to administrative load management measures manifested in energy and/or demand cuts and through rostering of agricultural pumpsets. Details of some of these power cuts are included in Table 4. The load restrictions ranging from 10 percent to 75 percent in different states are enforced generally on HT and LT industries and commercial consumers. Though domestic consumers are not subject to any notified cuts there are frequent breaks in power supply. This is more pronounced, particularly in the smaller towns and cities and in the rural areas.

Table 4: Power shortage as per cent of requirement
as in January 1990

Karnataka	23.7	Andhra Pradesh	7.9
Orissa	19.3	West Bengal	7.7
Bihar	15.5	Gujarat	5.5
Rajasthan	12.9	Tamil Nadu	4.4
Uttar Pradesh	12.8	Maharashtra	4.0
Haryana	10.6	Madhya Pradesh	2.6
		Punjab	2.2
All-India	8.8	Kerala	-

Source: Monthly review of the Indian economy,
centre for monitoring Indian economy,
March 1990.

The load curves of electric utilities in India indicate two peaks, the first occurring between 6-9 a.m. and the second between 7-10 p.m. (refer to Annexure 1). The system peak in most state systems occurs during the evening hours. Most states have imposed restrictions on demand and/or energy during the system peak hours; this is also the period when the demand from the domestic sector picks up. The evening hours bring on a sharp rise in the demand for electric lighting, mainly from domestic and commercial consumers, switching on of the television sets, increased fan utilisation etc.

Given the status-quo of power shortages accompanied by rationing and power cuts, the shape of the load curves at present is one arising out of constrained supply. It is pertinent to think here that had there been no rationing the shape of the load curves would have been very different. Considering that power shortages are a reality one will have to face for some time in the future, it is necessary to take a closer look at the demand side or end-use efficiency of power, especially for end-uses during peak hours.

The Government of India has been committed to energy conservation as a strategy to bridge the gap between demand and supply of energy as is evident from one-third of the budget allocation to power sector being reserved for energy conservation [4]. The Energy Management Cell in the Department of Power acts as a focal point to co-ordinate and promote energy conservation activities in the country. Some of the

areas presently being looked into include fixation of specific energy consumption targets mainly in regard to energy intensive industries, energy audits, study of electrical equipment and appliances commonly used in the domestic and commercial sectors, efficient lighting systems and awareness campaigns on the need and scope of electricity conservation.

The Energy Management Centre was set up in April 1989 as an autonomous organisation in collaboration with the Commission for European Community to promote research, training and dissemination of relevant information on energy conservation and management. The Bureau of Industrial Costs and Prices also carries out in-depth studies on energy consumption for selected energy intensive industries.

The Government and the financial institutions have several financing schemes for energy conservation but the electricity boards are yet to take active interest in energy conservation. They must, like their counterparts in the developed countries, view energy conservation as a complement to capacity addition. By investing in energy conservation schemes which are less expensive than construction of new power plants and more certain owing to their small size and short lead time, the utilities can avoid or postpone investments in future capacity.

This report concentrates on energy consumption in the domestic sector because, as has been said earlier, it is this

sector that contributes to a large extent to consumption during peak hours.

The main objectives of this study were to:

- (i) conduct a literature survey to find the contribution of different domestic appliances to total domestic electrical use and identify the electrical appliances that account for a major share in domestic electrical energy consumption.
- (ii) look at the norms prescribed for appliance efficiency standards in India and overseas.
- (iii) carry out efficiency measurements for a sample of these domestic appliances and estimate the quantum of energy that is wasted on their account, the sample including both well known leading brands and locally manufactured appliances.
- (iv) identify cost of some of the options to improve appliance efficiency and their effect on cost of the appliance and outline policy options to facilitate the process of increasing appliance efficiency.
- (v) measure the efficiency of appliances covered in order to study relationships between energy consumption and age of appliance, the efficiency of small vs. large manufacturers etc. by carrying out tests on these appliances. These tests will be carried out in accordance with BIS standards wherever available.

Presently this report concentrates on two aspects of

the study, first, the brand consciousness of the consumer in the purchase of domestic electrical appliances and its relationship with price of the product and second, the perspectives of the small scale manufacturers regarding the quality and energy efficiency of their products.

3. Methodology

Survey methodology for studying brand consciousness of consumers: A survey was carried out amongst 1100 households in Delhi in 1989. The respondents were to be grouped on the basis of income data. Since information on income of respondents was not easily forthcoming, monthly electricity consumption bills were taken as a proxy for income.

Accordingly, there were four categories:

Group	Monthly electricity consumption (x) (in Rs.)
I	$x \leq 30$
II	$30 < x < 60$
III	$60 \leq x$
IV	No answer

A systematic sampling strategy using electricity consumption as the key was used to select the sample consumers using the data from the EDP section of DESU. Subsequently, three districts were selected for survey. These were Janakpuri, R.K Puram and Paharganj. The required data was collected through questionnaires and field investigators were assigned to visit the households.

Data was collected relating to the brand, price and ISI specifications, if any, of the appliances. Analysis was carried out for ten appliances, namely, immersion rod, geyser/boiler, fan, desert cooler, airconditioner, room

heater, blower, washing machine, exhaust fan and refrigerator.

Survey methodology of study relating to small-scale manufacturers: In the field of domestic electrical appliances there are substantial margins for increase in energy efficiency either by way of technical improvement or simple substitutions e.g. substitution of two 60 W incandescent bulbs by one 40 W fluorescent lamp results in not only greater illumination but also longer duration of use. Bringing this about by way of creating awareness and interest and/or providing incentives and/or enforcement by the government, would have been simple, had all manufacturers been accessible. The fact remains that in India there is a large section of appliance manufacturers that are in the unorganised sector e.g. those manufacturing water heaters, room heaters, air coolers, fans.

Perceptions, concern and attitudes towards energy efficiency or quality control of the manufacturers in the small/medium/unorganised sector are unknown. It is with this view, that a survey was carried out amongst small-scale industries in order to study important issues relating to quality of appliances manufactured. Also this industry is largely assembly oriented rather than a manufacturing industry i.e. most of the "manufacturers" buy components, again generally from other small-scale units and assemble the final product.

Discussions with the Delhi Administration authorities in the course of our study revealed that registrations with the authority was not compulsory. This would mean that a vast majority of manufacturers do not fall within the purview of the same. Although presently, the Delhi Administration is not functioning like a regulatory body, this status quo poses a major hindrance to any enforcement or quality control that this department might bring into force.

Besides, the BIS standards are not compulsorily enforced for all appliances - not even major appliances. In fact, they are compulsory for only four appliances. Even the consumers are ignorant in the aspect of quality and efficiency and there is a great need to educate them and create awareness about energy conservation. In the absence of proper legislation, enforcement laws and awareness on the part of the consumer, a preponderance of spurious makes of appliances in the market is not a surprising development.

Looking at the energy efficiency aspect of appliances in the context energy shortages, we thought it prudent to study the perceptions and attitudes of the small-scale manufacturers of the more energy intensive appliances. In order to identify the latter, we took recourse to the findings of another study conducted by TERI, 1989. These findings state that in terms of energy consumed per unit of wattage of appliance, the appliances can be ranked in descending order.

S.No.	Appliance	S.No.	Appliance
1.	Refrigerator	8.	TV (Colour)
2.	Ceiling fan	9.	TV (Black & White)
3.	Air conditioner	10.	Table fan
4.	Fluorescent tubes	11.	Room heater
5.	Incandescent bulb	12.	Washing machine
6.	Coil heaters	13.	Geyser
7.	Air cooler		

Initially, six appliances were identified. These were:

- | | |
|------------------------|-------------------------|
| 1. Air conditioners ✓ | 4. Incandescent bulbs ✓ |
| 2. Air coolers ✓ | 5. Refrigerators ✓ |
| 3. Fluorescent tubes ✓ | 6. Ceiling fans ✓ |

Later, the following were added after discussions with officials from Energy Management Centre:

- | | |
|-----------------|--------------------|
| 7. Geysers ✓ | 10. Immersion rods |
| 8. Cooler pumps | 11. Room heaters |
| 9. Exhaust fans | |

The next step was to identify the manufacturers of these appliances in the small-scale sector. A beginning was made by initiating discussions with organisations who could provide us with a master list of names and addresses of small-scale units, involved in manufacture of electrical appliances. Enquiries were initiated with state-level financing organizations, which included DSIDC, Delhi Finance Corporation and various manufacturers' associations, research institutions, Commissioner of Industries, CEI etc. Discussions with officials at the office of the Commissioner

of Industries, Delhi Administration revealed that Delhi administration has a Survey Officer whose job is to maintain a list of the manufacturers who are registered under the small-scale industry scheme. This source proved inadequate as such registration is not mandatory and as a result data on small-scale manufacturers cannot be expected to be exhaustive. There is also no up-to-date list of these unregistered manufacturers with any official agency.

We also contacted the Delhi Electrical Traders Association (DETA) but this did not yield much result as they did not have data on manufacturers of electrical appliances. We have also consulted all-India Associations like IEEMA, ELCINA and Electric Fan Manufacture Association etc. We found that the members of such organisations are mainly the large and medium scale industries. Another visit to an electrical manufacturers' association (Anand Parbat) was also fruitless.

We contacted the associations of the respective industrial areas for up to date lists. We were successful in obtaining some names and addresses from them. We also selected names and addresses from :

- (i) The Industrial directory of manufacturers in the National Capital Region (1988-89) - compiled by the PHD Chamber of Commerce.
- (ii) The Haryana Industrial directory (1988).
- (iii) The directory compiled by National Small Industries Corporation (1987).

A questionnaire was then designed with the main focus on ascertaining the quality consciousness of the manufacturer. A copy of the same is enclosed in the Annexure. The same was then pilot-tested and appropriate modifications made. Field investigators were assigned to collect the required data through personal interviews.

One major problem encountered during the survey was the sample to be surveyed. We had obtained an estimate from the Delhi Administration of the number of small industries in Delhi and surrounding areas to be about 80000, of which an estimated 20000 were actually registered. From the master list they had, we were able to extract names of only 50 small-scale industries manufacturing the appliances selected for our study. To this list we added names and addresses compiled from the sources mentioned earlier and were able to obtain a list of about 230 manufacturers.

But during the course of the survey our field investigators found that most of the addresses we had on the manufacturers was either incomplete or outdated. In some cases the addresses were incomplete and/or incorrect. In others, where the addresses were correct, the manufacturers concerned had changed their line of production completely. Some firms had even closed down while some had shifted from manufacturing to dealing in or repairing the appliance. Finally, we were able to obtain completed questionnaires from 66 manufacturers only.

4. Data Analysis

Brand consciousness

Analysis of brand data has been done on the basis of percentage of local brands in the appliance and the percentage of well-known brands. The analysis is presented in Annexure 2. There were several cases where our investigators could not get a response and these have been summed up in the N.A. (No answer) column. The percentage of no response ranged from 10 to 65 per cent (the latter in case of fans).

The percentage of local brands purchased was the highest in the case of desert coolers, immersion rods and room heaters and lowest in case of refrigerators, fans and airconditioners. The converse was true for the percentage of well known brands, with some exceptions e.g. fans had a low percentage of local purchases and also of well known brands.

Immersion rods: As is clear from the analysis in Annexure 3 for immersion rods, 72 percent of the respondents did not give any response regarding the prices. Regarding price paid by consumers, 22 percent of the respondents preferred immersion rods costing between Rs.50 - Rs.125. Since it is local brands that are available in this price range, we can conclude that about 17 percent of our sample and more than half of those who responded, are not particularly brand conscious. On the other hand approximately 9 percent of the respondents had purchased immersion rods that had costed more

than Rs. 100 and that was a well-known brand e.g. Bajaj, Ditz, Surya. Due to the dominance of local brands in this case the price range is quite wide, the lowest being Rs. 25 and the highest above Rs.150.

Desert coolers: Desert coolers was another appliance where local brands dominated. Of the total sample, 51 percent were local brands while only about 29 percent were well-known. This is evident from the brand data in Annexure 2. The preference for local brands in case of desert coolers is reiterated by information on price of the desert coolers purchased. It is evident from Annexure 4, that of the respondents who answered, the highest percentage bought desert coolers in the price range of Rs.1600 - 2400. Although both local and well-known brands are available in this category, the latter, e.g. Khaitan, Coolhome, Voltas are more expensive, costing more than Rs. 2000, while the local brands are cheaper.

Refrigerators: As highlighted in Annexure 2, a negligible percentage of respondents preferred local brands in the purchase of refrigerators, while 62 percent of the respondents preferred well-known brands, e.g. Allwyn, Godrej, Voltas, Kelvinator, Zenith. Price data on refrigerators (Annexure 5), shows concentration of price in the range Rs.4000 - 8000. Higher concentration in the range Rs. 6000 - 8000 probably indicates imported brands or shows a bias towards a particular size.

Geysers: In case of geysers, while 26 percent of the consumers could not provide any information regarding brands, a majority i.e. 51 percent preferred well-known brands e.g. Elite, Ditz, Thermoking, Hylex, that costed anywhere between Rs.800 - 1500, with some very popular ones like Racold costing Rs. 2000 and above. This fact is corroborated by the price data in Annexure 3 which shows concentration in the price range Rs. 800 to Rs. 1600. Since the local brands of geyser/boiler cost anywhere between Rs. 300 - 1200, we can conclude that the data on price reinforces the evidence that the respondents have a preference for well-known brands in the purchase of geysers/boilers.

Fans: Although in the case of fans, we got a very large percent of no response (65 percent), we did arrive at some conclusions based on the information got from those who did answer (refer to Annexure 2). The share of local brands in the total was very small (only about 5 percent), while that of well-known brands was substantially larger (30 percent). Price data on fans (refer to annexure 3) reveals that the respondents generally purchased appliances in the price range of Rs. 600 - 800. Since this price range is on the higher side, we can conclude that in the case of fans well-known brands dominate the market.

Air-conditioners: The data on air-conditioners was more conclusive than that on some other appliances as, it had a relatively small percentage of no response. Of the total respondents, as large a share as 65 percent purchased air-

conditioners from well known sources. Only about 21 percent of the respondents bought these from local sources. The price data on air-conditioners in Annexure 4 reveals that respondents generally purchased air-conditioners in the price range of Rs. 15,000 - 20,000. This reiterates our earlier conclusion that air-conditioners are generally purchased from well-known sources.

Room-heaters: Brand data in Annexure 2 and price data in Annexure 4 provide the general conclusion that room-heaters are more often than not, purchased from local sources, rather than well-known ones.

Regarding preference of consumers for ISI mark appliances, we were able to get only a negligible response from our sample. The reasons could be attributed to the consumers being unaware of ISI specifications or simply a case of "no response"; the result was that we could not arrive at any conclusions about buyer attitudes towards appliances with ISI mark.

In conclusion, we found that our major stumbling block was lack of response from the respondents. We received almost negligible response regarding ISI preference. Although our information on prices of various appliances was limited, on an average it was found that the appliances manufactured locally were relatively cheaper than those manufactured by well-known manufacturers. Our general conclusion was that appliances such as fans, air-

conditioners, refrigerators and geysers were bought from well-known manufacturers. On the other hand immersion rods, room heaters and desert coolers are purchased generally from local manufacturers.

Analysis of data on small-scale sector

Turnover and workforce: As stated earlier, we had data ultimately for only 66 respondents. The data was coded and entered in the Lotus format. The annual turnover of the respondents varied from Rs. 5 - 130 lakhs with almost 70 percent of these being in the range of less than Rs. 20 lakhs. This is brought out in Annexure 6. Although quite a few of the respondents were reluctant to give exact information regarding their annual turnover, we were able to obtain some approximate figures. There were only about 6 percent of the respondents for whom we were not able to get any response.

Regarding the number of people employed by the respondents, 83 percent of the respondents employed less than 20 people with about 56 percent employing less than 10 persons (refer to Annexure 7); as regards the hours of operation, 61 respondents (92 percent) worked in single shifts and the remaining in double shifts. Since the production of seasonal appliances like coolers and room heaters, fluctuated substantially, the employment and the number of shifts they operated were according to the seasonal variations in the demand for the product.

Installed capacity and production: In order to gauge the installed capacity of these units, questions were asked on the same. Although some respondents supplied this information, others said that they did not as such have any 'installed capacity' and that they altered their capacity in tune with the variations in demand. Annexure 8 gives the average percentage share of each appliance in the total sample along with the average annual capacity (in units). As expected, refrigerators are not manufactured at all in the small-scale sector. A very small percentage of the sample manufactured fluorescent tubes (these were M/s Vallabh Engineering Works, Fluorescent Sales Corporation) and incandescent bulbs, the percentages being 3 and 4.5 percent respectively. The appliance that is most commonly manufactured in the small-scale sector is the desert cooler, having a percent share of almost 30 percent. This is followed by air-conditioners and exhaust fans, that have a share of 22.7 percent each.

We had also attempted to extract information on the growth rate of annual production of each appliance for each respondent, so that we could get an idea of the trend of production in the small-scale sector over the past five years, from 1985/86 - 1989/90. Unfortunately we were not able to elicit any response on this for a variety of reasons. Most of the respondents found the information too voluminous to give. Some of them did not want to provide the data and others did not remember the figures for 1985/86. Our

investigators even tried to obtain comparative figures for other years but they were not successful.

Regarding the source of the technology used in manufacture with the exception of one respondent, all respondents stated that the technology used was developed in-house independently, and not in collaboration with any other manufacturer. The distribution outlets for the products manufactured by these units were classified into five main categories. These outlets along with the number of respondents who chose them are entered in Annexure 9. The most popularly used mode of distribution was direct sales to customers. 50 respondents out of the total sample of 66 (75.7 percent) preferred this. Distribution through retailers and wholesalers was adopted by 33 percent and 29 percent of the sample respectively. Sales through selling agents (including sole agents) was an outlet which was seldom used. It was also observed that 65 percent of the respondents used only one outlet for distribution, while approximately 26 percent used two outlets. A very small percentage of the sample used more than two outlets (please refer to Annexure 9).

Registration: Regarding registration of these sample units with the Delhi Administration, we discovered that 59 respondents (almost 90 percent) possessed a small-scale registration number (called SSI number). The reasons for the above are listed in Annexure 10 along with the percentage

share of respondents who gave the reason. It was found that the facility of concessional finance was the reason cited most of the time by the respondents. In fact facilities for purchase and procurement of raw materials and concessional finance constituted the two main reasons why manufacturers in the small-scale sector opted for a SSI number.

Some manufacturers cited priority sales to Government organizations and excise exemptions as reasons for opting for a SSI registration. There were also manufacturers in Anand Parbat industrial area who stated that they could not obtain a SSI registration on account of their area being unauthorised. There were some respondents who although they possessed a SSI number, felt that it was of no substantial use and provided them with no benefits. About 11 percent of the sample also had the misconception that SSI registration was compulsory.

Quality control: In order to be able to gain some idea about the perceptions of the small-scale sector on quality, the respondents were asked as to whether they were registered with any official quality control agency e.g. Bureau of Indian Standards, Regional Testing Labs, Delhi Administration. We found that only 20 respondents (30 percent) were registered with an official agency and the remaining stated that they were not. Only one respondent did not give any response. Not only was the over all percentage of respondents registered with an official quality control agency low, but the percentage registered across appliances

was also not very encouraging. As evident from Annexure 11, only about 30 percent of respondents manufacturing air-conditioners and again 30 percent of those manufacturing air-coolers and incandescent bulbs, were registered for quality control and inspection. Even in case of an appliance like geysers only about 71 percent was registered (although the number of respondents manufacturing geysers is rather small to come to any definite conclusions).

As far the various agencies are concerned it was found that some respondents in Faridabad were registered with the Quality Marking Scheme (QMS). There were others who got their products tested at the National Small Industries Corporation (NSIC) Labs. The category of 'Others' in the Annexure 11 includes the Delhi Administration testing facilities, Regional Testing Labs and the NSIC labs. The majority of respondents were registered with the BIS. Here again we faced the problem of quite a substantial number of respondents who did not give any response.

In the absence of registration with any official quality control agency, the respondents were posed the question whether they were carrying out any tests voluntarily at the factory premises. Seventyfive percent of the respondents stated that they were carrying out quality control/inspection at their own premises, often using the BIS standards prescribed for such tests. This information may be subject to a reasonable measure of doubt considering they did

not always supply us with complete information on all the tests they were carrying out, location of test labs etc.

An important aspect related to quality control was that of registration with the ISI scheme. It was found that only 7 respondents (about 10 percent) possessed an ISI mark, while about 60 percent did not have one. About 30 percent did not give any response in this context. Of the 40 respondents who did not possess an ISI mark, 20 respondents (50 percent) said that they would go in for one in the near future. On the other hand about 25 percent stated categorically that they were not at all interested in applying for ISI as it meant an increase in the cost of production, a consequent fall in profit margins and most of all a responsibility towards quality of the product.

The seven respondents who did possess an ISI mark, had the following reasons to give: excise exemptions, testing facilities of the BIS, an enhanced market image. There were some who were in the process of obtaining an ISI mark.

Since the quality of an appliance depends also on the components used, we asked the respondents about the percentage of the components procured from outside, as against manufacturing internally, for the appliance that they manufactured. Of the percentage of components procured from external agencies, we also obtained information on the share of components purchased from local and well-known sources of purchase. Individual information for each respondent and

appliance was averaged and is presented in Annexure 13. Generally speaking, 60-70 percent of the appliance is manufactured internally. The only exception is fluorescent tubes and immersion rods, of which approximately 90 percent is manufactured internally. We cannot rely on the information on incandescent bulbs since there are only three respondents manufacturing these.

Tests for quality control: The question relating to the type of quality control tests being carried out in the factory premises revealed that 75 percent of the respondents did carry out several tests in their factory premises. While some of the tests were performed on 100 percent of the units' production, there were a few tests which were performed in samples for different production batches (for details, see Annexure 14).

Tests were reported on electric motors used in different appliances which were tested 100 per cent. The tests included high voltage test, measurement of RPM, voltages, current, losses etc. and these according to responses received were being carried out as given in the relevant standards of BIS. Cooler pumps were tested for measurement of delivery (on a sample), high voltage, voltage and current measurements. In addition, leakage tests for proper earthing, no load tests and temperature rise tests were also carried out.

Geysers were tested for standing losses, energy

consumption, thermostat performance etc. For ceiling fans, apart from the tests on voltage, current, RPM measurements, respondents mentioned air-delivery tests. No additional information on how this was done, was provided. Measurement of power factor was also being done on fans, motors and pumps.

Air-conditioners were tested for noise tests, temperatures measured at grill, air-flow, apart from the normal supply parameters measurement. Measurement of power factor was not mentioned by any manufacturer. The respondents did point out that average consumption, wattage were being measured. Coolers were also subjected to tests relating to average consumption tests, in addition to others. However, no additional information was obtained on the sample size, the time for which these tests are carried out, or the range of consumption in the products manufactured.

Energy labelling: The question of energy labelling was also dealt with in the survey by asking the respondents whether they would like to voluntarily provide the buyer with information on the energy consumed by the appliance. In administering the question to the respondent the wattage of the appliance was clearly distinguished from the energy consumed by the appliance. About 60 percent said that they would not object to voluntarily mentioning the energy consumption on the nameplate of the appliance. The remaining 40 percent refused to do so.

The reasons for their refusal are listed in Annexure 12. These reflect a general indifference of the consumers and manufacturers towards energy conservation. Quite a sizable percentage of respondents felt that this would only add to the costs without compensatory benefits. Some of them even expressed their frank opinion that if they stamped the actual energy consumption on the nameplate of the appliance, the consumer would be able to differentiate, and hence was likely to prefer the more energy efficient appliance.

5. Conclusions

- (i) A household survey amongst 1100 domestic consumers was carried out in Delhi. Data collected on brands and prices of appliances suggests that consumers prefer local brands as compared to well-known brands, in the purchase of desert coolers, immersion rods and room heaters. The converse is true in case of fans, refrigerators and air-conditioners.
- (ii) Consumers had almost nil awareness on whether the appliances they used had ISI mark or not.
- (iii) The recall on prices of appliances purchased was poor. The number of no answers for price of appliances was very high.
- (iv) The survey on small-scale industries yielded information on turnover, employment, installed capacity, technology used and attitudes towards quality control of the sixty-six small-scale appliance manufacturers. The annual turnover was on an average less than Rs. 20 lakhs with the units generally employing less than 20 persons. These units generally operated in single shifts. The most commonly manufactured appliance in the small-scale sector was desert cooler and this constituted almost 30 percent of the total appliances that we considered.

- (v) The technology used in these small-scale units was developed inhouse and not in collaboration with any other manufacturer. The form of distribution was generally direct sales to customers followed by sales through retailers and wholesalers. Sales through selling agents was uncommon.
- (vi) Regarding the aspect of quality control, we found that almost 90 percent of the respondents were SSI registered units. This may have been on account of the source of addresses of the units in our sample being mainly official. The reasons for opting for registration were raw material facilities, concessional finance, priority of sales to Government organizations, priority in DGS & D rate contracts, excise exemptions and grant of subsidies.
- (vii) However, only 30 percent of the respondents were registered with an official quality inspection and control agency. This is an indication of the attitude that the small sector has for the official certification agencies, and in general towards maintaining quality standards. This was true for each of the appliances surveyed. At the same time, seventy-five percent of the sample also claimed to be carrying out tests for quality in the factory premises itself. This result cannot totally be relied upon, as the supporting information regarding the nature of tests carried out was not always forthcoming.

(viii) The percent share of respondents with ISI registration was very low. Only 10 percent were registered with ISI. Of those not registered, 50 percent said that they were interested in applying for ISI registration, while 25 percent said categorically that they were not. Among the reasons given by the latter were increased responsibility, increased costs of production and consequent fall in profit margins.

(ix) The response regarding energy labelling was largely encouraging, with about 60 percent of the respondents stating that they would not object to voluntarily including the energy consumption in the nameplate of the appliance.

(x) The reasons given by respondents who were against the concept of energy labelling provided valuable insight into the attitudes of manufacturers in the small-scale. Most of these felt that it would simply not be "worth the effort". They felt that the consumers were basically unconcerned about the energy consumption of the appliance. Besides, this would only add to the costs of the product without any compensating benefits.

This report highlights the almost total lack of awareness amongst consumers as regards ISI marks for appliances. Considering the important role being played by BIS in initiating and maintaining standards, there is an urgent need to carry out a campaign to educate the consumers

regarding ISI standards.

The low percentage of small industries being registered with any official testing agency and the low percentage of industries who have ISI marks, is cause for concern. It is necessary to explore different options to ensure that quality is maintained, even though it involves an expense. These will be examined in the final report.

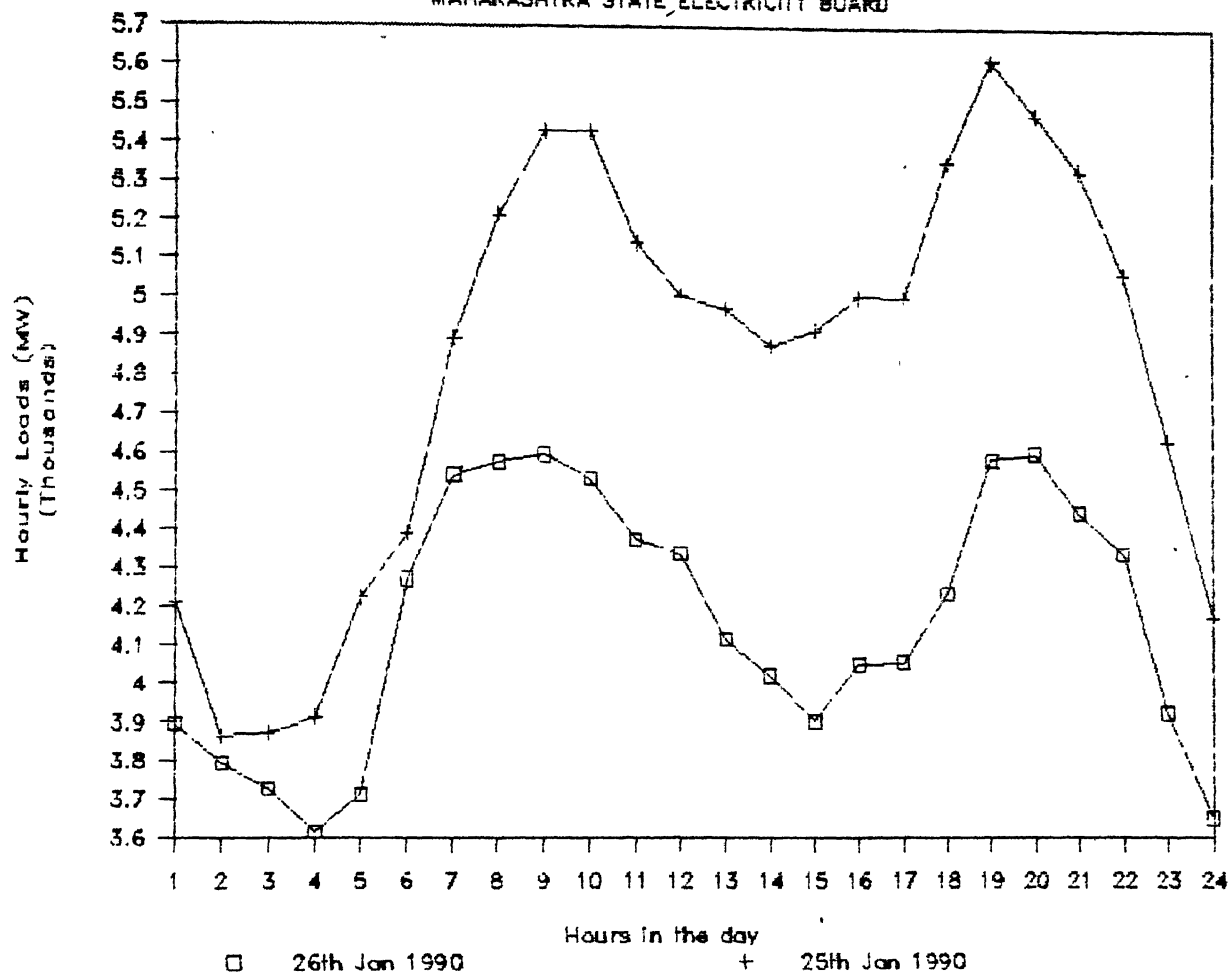
References:

1. Gupta R, Purnima M., "Relevance of energy audit", Yojna, March 1-15, 1990, New Delhi.
2. The GDP figures were taken from The Economic Survey, 1989-90 and the electricity consumption figures from the Tata Energy Data and Directory Yearbook, 1989.pg.73. The Electricity-GDP elasticity coefficient was estimated by the formula :

$$e = \frac{\text{percentage change in Electricity Consumption}}{\text{percentage change in GDP}}$$

3. Monthly Review of the Indian Economy. Centre for monitoring Indian Economy, March, 1990. Page 9.
4. Rajgopal. S.. Inaugural address at a seminar on "Energy Conservation in Lighting Equipment" at Hotel Samrat, New Delhi, March 1990.

DAILY LOAD CURVE FOR MAHARASHTRA STATE ELECTRICITY BOARD



Information on brands of appliances

Appliance	No. of app.	BRANDS						ISI		
		LOCAL		WELLKNOWN		N.A.		YES	NO	N.A.
		No.	Per cent	No.	Per cent	No.	Per cent			
Immersion rods	236	117	49.5	50	21.2	69	29.2	3(1.27)	0	233 (98.72)
Geyser/boiler	270	62	23.0	138	51.1	70	25.9	0	0	270
Fans (Pedestal)?	579	27	4.6	175	30.2	377	65.1	0	0	579
Desert cooler	544	277	50.9	156	28.6	111	20.4	0	0	544
Air conditioner	37	8	21.6	24	64.8	5	13.5	0	0	37
Room heater	183	70	38.2	53	28.9	60	32.8	0	0	183
Blower	48	11	22.9	29	60.4	8	16.6	0	0	48
Washing machine	167	56	33.5	94	56.3	17	10.2	0	0	167
Exhaust fans	101	30	29.7	53	52.4	18	17.8	0	0	101
Refrigerator	489	2	0.4	301	61.5	186	38.0	0	0	489

Figures in parentheses indicate percentage
Unit = numbers

Data on prices of appliances

Immersion Rod			Geyser/Boiler			Fan		
Price Range (Rs)	No. of app.	Per cent	Price Range (Rs)	No. of app.	Per cent	Price Range	No. of app.	Per cent
N.A.	170	72.0	N.A.	217	80.3	N.A.	503	86.8
0-25	0	0.0	0-400	1	0.3	0-200	0	0.0
25-50	3	1.3	400-800	10	3.7	200-400	5	0.8
50-75	13	5.5	800-1200	14	5.2	400-600	16	2.7
75-100	28	11.8	1200-1600	13	4.8	600-800	48	8.3
100-125	11	4.6	1600-2000	10	3.7	800-1000	5	0.8
125-150	6	2.5	2000-2400	2	0.7	1000 & above	2	0.3
150 & above	5	2.1	2400-2800	1	0.3			
			2800 & above	2	0.7			

Data on prices of appliances

Desert Cooler			Air Conditioner			Room Heater		
Price Range (Rs)	No. of app.	Per cent	Price Range (Rs)	No. of app.	Per cent	Price Range (Rs)	No. of app.	Per cent
N.A.	330	60.7	N.A.	22	59.4	N.A.	152	83.0
0-800	0	0.0	0-5000	0	0.0	0-50	0	0.0
800-1600	13	2.3	5000-10000	2	5.4	50-100	6	3.2
1600-2400	126	23.1	10000-15000	1	2.7	100-150	14	7.6
2400-3200	62	11.3	15000-20000	10	27.0	150-200	6	3.2
3200-4000	10	1.8	20000-25000	1	2.7	200-250	3	1.6
4000-4800	2	0.3	25000-30000	0	0.0	250-300	0	0.0
4800-5000	0	0.0	30000 & above	1	2.7	300-350	1	0.5
5000 & above	1	0.2				350-400	1	0.5
						400 & above	0	0.0

Data on prices of appliances

Blower			Washing Machine			Exhaust Fan			Refrigerator		
Price Range (Rs)	No. of app.	Per cent	Price Range (Rs)	No. of app.	Per cent	Price Range (Rs)	No. of app.	Per cent	Price Range (Rs)	No. of app.	Per cent
N.A.	26	54.1	N.A.	104	62.2	N.A.	74	73.2	N.A.	323	66.0
0-200	0	0.0	0-3000	1	0.6	0-100	0	0.0	0-2000	0	0.0
200-400	0	0.0	3000-6000	53	31.7	100-200	1	0.9	2000-4000	9	1.8
400-500	11	22.9	6000-9000	3	1.8	200-300	7	6.9	4000-6000	41	8.3
500&above	11	22.9	9000-12000	2	1.2	300-400	7	6.9	6000-8000	92	18.8
			12000-15000	1	0.6	400-500	8	7.9	8000-10000	16	3.2
			15000&above	3	1.8	500-600	3	2.9	10000-12000	3	0.6
						600&above	1	0.9	12000-14000	2	0.4
									14000-16000	0	0.0
									16000&above	3	0.6

Annual turnover of respondents in 1989-90

Turnover (Rs.Lakhs)	Number of Respondents	Percentage of Respondents
N.A.	4	6
0-10	24	36
10-20	22	33
20-30	6	9
30-40	3	5
40-50	0	0
50-60	2	3
60-70	2	3
70-80	0	0
80-90	2	3
90-100	0	0
100-110	0	0
110-120	0	0
120 & above	1	2

Annexure 7

Data on employment

Employees (Number)	Number of Respondents	Percentage of Respondents
N.A.	1	0
0-10	37	56
10-20	18	27
20-30	4	6
30-40	3	5
40-50	1	2
50-60	1	2
60-70	0	0
70 & above	1	2

Annexure 8

Average annual installed capacity

Appliance	No.of resp. manufacturing appliance	Average Annual Capacity
Air conditioners	15	1717
Flourescent lamps	2	400
Incandescent bulbs	3	52333
Refrigerators	0	0
Ceiling fans	4	50500
Geysers	7	3743
Room heaters	6	9033
Desert coolers	19	2111
Immersion rods	6	27417
Cooler pumps	11	5345
Exhaust fans	15	6349

Distribution outlets

Code No.	Mode of distribution	No. of resp.	Per-cent
1	Direct sales to customers	50	75.7
2	Direct sales to retailers	22	33.3
3	Through wholesalers	19	28.8
4	Through selling agents	5	7.5
5	Through sole selling agents	4	6.0

No. of distribution outlets per respondent

No. of outlets	No. of respondents	Percent of respondents
1	43	65.1
2	17	25.7
3	5	7.5
4	1	1.5

Reasons for opting for SSI registration

Code	Reason	No. of respondents	Percentage
0	No answer	6	10.1
1	Facilities for raw material	12	20.3
2	Concessional finance	21	35.5
3	Priority in sales to govt	8	13.5
4	DGS & D Rate contracts	6	10.1
5	Excise exemption	8	13.5
6	Subsidy	2	3.3
7	Regn. is compulsory	7	11.8
8	No specific reason/others	3	5.0

Information on registration for quality control

Appliance	No. of resp. manufacturing	No. regd. for quality control	Percent regd.	No. regd. per agency				Percent regd. per agency			
				BIS	Others	QMS	N.A.	BIS	Others	QMS	N.A.
Air conditioners	15	4	27	3	1	0	0	75	25		
Flourescent lamps	2	0	0	0	0	0	0				
Incandescent bulbs	3	1	33	1	0	0	0	100			
Refrigerators	0	0	0	0	0	0	0				
Ceiling fans	4	2	50	0	0	0	2				100
Geysers	7	5	71	2	1	0	2	40	20		40
Room heaters	6	5	83	3	0	0	2	60	0		40
Desert coolers	19	6	32	1	0	2	3	17		33	50
Immersion rods	6	1	17	1	0	0	0	100			
Cooler pumps	11	6	55	1	0	1	4	17		17	67
Exhaust fans	15	10	67	7	1	2	0	70	10	20	

BIS - Bureau of Indian Standards

QMS - Quality Marking Scheme

Others - includes Delhi Administration Testing Facilities, NSIC, Regional Testing Labs.

Reasons for non-preference for energy rating

Code No.	Reason	No. of respondents	Per-cent
0	No answer	1	4
1	Ignorance of consumer	10	40
2	Increase in cost	9	36
3	Small variations, no effect	4	16
4	Respondent not bothered	9	36
5	Negative effect on sales	5	20
6	Minimum information be provided to the consumers	2	8
7	Due to voltage fluctuation, not manufacturer's fault	1	4

Source of components used in appliances

Appliance	Avg. percent share of components made in factory	Avg. percent share of components	
		local	well-known
Air conditioners	58	20	62
Flourescent lamps	93	20	80
Incandescent bulbs	100	0	0
Refrigerators	0	0	0
Ceiling fans	65	83	75
Geysers	62	73	78
Room heaters	77	70	97
Desert coolers	69	44	46
Immersion rods	86	55	90
Coolers Pumps	62	61	53
Exhaust Fans	65	73	72

Quality control tests:

(I) Electric Motors

1. Power
2. High Voltage
3. Insulation Resistance
4. Current
5. Log test
6. Voltage
7. RPM

As per ISI Standards

(II) Cooler Pumps

1. Capacity
2. Power factor
3. Temperature (Rise)
4. High Voltage
5. Leakage current test
6. Earthing test
7. Starting current
8. Water Rise
9. Ampere
10. Insulation Resistance
11. No load

As per ISI Standards

(III) Geyser

1. High Voltage
2. Insulation Resistance
3. Leakage
4. Humidity
5. Standing loss
6. Rated I/P (Input)
7. Raw material quality
8. Thermostat (deviation of dial calibration)
9. Element performance tests
10. Wattage
11. Energy Consumption
12. Pressure

(IV) Ceiling Fans

1. High Voltage
2. Insulation Resistance
3. DC unit
4. Watts
5. Watts, speed, current
6. Power factor
7. Resistance
8. Rotation
9. Air delivery
10. RPM

As per ISI Standards

(V) Air Conditioners

1. Ampere test
2. Cooling test
3. Drop in temperature
4. High Voltage
5. Insulation Resistance
6. Air flow
7. Grill temperature
8. Ambient temperature
9. Capacity test
10. Current & Wattage
11. Leakage test
12. Routine test
13. Acceptance test
14. Run test at rated voltage
15. Wattage consumption
16. Noise level
17. Average consumption test

(VI) Coolers

1. High Voltage
2. Insulation Resistance
3. Leakage current
4. Zero static charge
5. Pressure test for cooling efficiency
6. Temperature rise test
7. Routine test
8. Acceptance test

9. Water rise
10. Ampere
11. RPM
12. Air flow
13. Noise
14. Average consumption test
15. Cooling test
16. Air delivery
17. Routine test
18. Current, watt test
19. Wattage
20. Rated Voltage
21. Rated Current

(VII) Fluorescent Lamps

1. High Voltage
2. Watt loss
3. Humidity test
4. Ampere
5. Cold resistance
6. Wind load
7. Mechanical strength test
8. Rain proof test

(VIII) Exhaust Fans

1. Watt, speed, current
2. Power factor
3. Insulation Resistance
4. Bearing size , O/D

5. Stator lamination tests

- (1) Insulation Resistance
- (2) Resistance
- (3) Polarity
- (4) Rotation
- (5) Surge test

6. High Voltage

7. Insulation Resistance

8. Starting test

9. Earth continuity test

10. Electrical I/P test

11. Speed test

12. Air delivery test

13. Temperature rise test

14. Power factor test

15. AC leakage test

As per ISI Standards

(IX) Bulbs

1. Rated Voltage

2. Rated Current

As per ISI Standards

(X) Refrigeration Unit

1. As per party's orders

(XI) Room-Heaters

1. Wattage

2. High Voltage

3. Leakage
4. Megger
5. Performance
6. Raw material quality
7. Temperature tests
8. Wattage
9. Shock
10. Continuity

(XII) Immersion Rods

1. Wattage
2. High Voltage
3. Megger test
4. Leakage test
5. Shock
6. Continuity

TATA ENERGY RESEARCH INSTITUTE
7 JOR BAGH, NEW DELHI - 110003

Questionnaire for Appliances Manufacturers

3.1. Name and address of the manufacturing unit:

Telephone No.:

1.2. Name and Designation of person interviewed.

.3. What is the annual turnover for 1989-90: (Rs.lakhs)

.4. What is the average number of people employed in the unit?

.5. No. of shifts in a day the unit is operational?

Shift timings
From To

One

Two

Three

6. Name the products manufactured and their annual installed capac

S.No. Name of the Units Annual
Capacity

2

3

4

7 Annual production (in units):

1985-86 1989-90

Product 1	
Product 2	
Product 3	
Product 4	

Q.8. The design for your product is :

A. In collaboration with
(Please give name of the collaborator)

B. In-house development

Q.9. The distribution of your product is through :

- direct sales to customers
- direct sales to retailers/dealers
- wholesalers/distributors
- selling agents
- sole selling agents

Q.10. Do you have an SSI No.?

Yes

No

If yes, why did you go in for a SSI registration number?
If no, why not?

Q.11 Are you registered with any official quality inspection agency(e.g. BIS, Regional Test Lab, Delhi Admn.)?

If no, go to Q.12.
If yes, give details.

S.No.	Name of Product	Name of agency	Year of Regn.

Q.12(a) Do you carry out any tests of quality, voluntarily?

Yes

No

If yes, enter details in attached sheet.

(b) Did you try for an ISI mark?

☐ Yes

☐ No

If yes, why didn't you obtain one?

If no, do you now plan to try and get ISI mark?

Q.13. It has been suggested that the appliance nameplate should carry, along with the wattage and other ratings, the amount of energy it consumes per hour of continuous usage e.g.

RATING	- 400 watt
UNITS CONSUMED IN ONE HOUR	- 0.5 units

Would you like to add this to the nameplate voluntarily?

☐ Yes

☐ No

If no, what are your specific reasons:

If yes, do you think it should be made compulsory:

☐ Yes

☐ No

Q.14(a) What is the percentage of the appliance components which are manufactured inside your unit :

S.No.	Name of the Product	Percentage
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----

Q.14(b) Of the components that you buy from outside what is the percentage of local brands Vs. well-known brands (e.g. Eskayef, TVS)

S.No.	Name of the Product	Local Brand (%)	Well-Known (%)
-------	---------------------	-----------------	----------------

-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----

S.No.	Name of appliance	Tests carried out	Batch or 100% testing (if batch, indicate batch size)
1		No.1	
		No.2	
		No.3	
2		No.1	
		No.2	
		No.3	
3		No.1	
		No.2	
		No.3	
4		No.1	
		No.2	
		No.3	